Medical Review of North Carolina, Inc.

Managed Care Diabetes Project

Evaluation Report

EXECUTIVE SUMMARY

BACKGROUND: Diabetes mellitus is the seventh leading cause of death in North Carolina and in the nation. Persons with diabetes in North Carolina have an eighty percent greater rate of death from stroke, more than twice the rate of death from coronary heart disease, and three times the rate of death from hypertensive heart disease compared to those without diabetes. In the United States, diabetes mellitus is the most important cause of lower extremity amputation and end stage renal disease, the major cause of blindness among working age adults, and a major cause of disability and premature mortality.

METHODOLOGY: Project quality indicators assess processes of care and intermediate outcome measures early detection of diabetic complications and enable informed decisions regarding disease management. The quality indicators measured in this project include the following: hemoglobin A1c (HbA1c) testing, HbA1c control, lipid profile, low density lipoprotein cholesterol (LDL-C) control, nephropathy assessment and dilated eye exam. Cases eligible for inclusion were diabetics enrolled in Medicaid managed care that had either two outpatient visits or one inpatient visit during calendar year 1998 for the baseline study period, and 2000 for the evaluation study period, and were between the ages of eighteen and seventy-five. Data were collected from medical record review done on-site at primary care physician offices. Project success was measured by improvement over baseline performance on the project quality indicators.

RESULTS: The following tables display aggregate baseline and evaluation results for the project quality indicators (measurable aspects of care). Complete information is provided in the body of the report.

CONCLUSIONS: Results from the Medicaid Aggregate data indicate statistically significant improvement ($p<.05$) from the baseline in all of the quality indictors except dilated eye exams. The high morbidity and mortality associated with diabetic complications may be prevented by continued emphasis on improving performance on the Managed Care Diabetes Project quality indicators.

Quality Indicator	Access 1				Access 2/3				Williams				Aggregate			
	Baseline		Evaluation		Baseline		Evaluation		Baseline		Evaluation		Baseline		Evaluation	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
HEMOGLOBIN (HBA1C) TESTING	327	61	441	76	256	66	441	83	8	38	17	59	783	62	1140	80
POOR HBA1C CONTROL	327	60	441	44	256	54	441	33	8	75	17	59	783	58	1140	40
LIPID PROFILE	327	37	441	46	256	36	441	52	8	50	17	53	783	35	1140	50
LDL CHOLESTEROL (LDL-C) CONTROL	103	59	184	67	85	58	222	73	4	50	9	33	246	59	537	69
NEPHROPATHY ASSESSMENT	298	14	383	30	231	19	364	32	6	33	12	33	718	17	967	30
DILATED EYE EXAM	277	14	315	10	205	18	289	19	8	0	14	7	654	15	802	14

Quality Indicator	Wellness				Southcare				United				Aggregate			
	Baseline		Evaluation		Baseline		Evaluation		Baseline		Evaluation		Baseline		Evaluation	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
HEMOGLOBIN (HBA1C) TESTING	192	61	202	86	n/a	n/a	4	50	n/a	n/a	35	89	783	62	1140	80
POOR HBA1C CONTROL	192	61	202	44	n/a	n/a	4	100	n/a	n/a	35	46	783	58	1140	40
LIPID PROFILE	192	31	202	58	n/a	n/a	4	0	n/a	n/a	35	34	783	35	1140	50
LDL CHOLESTEROL (LDL-C) CONTROL	54	61	112	67	n/a	n/a	0	0	n/a	n/a	10	50	246	59	537	69
NEPHROPATHY ASSESSMENT	183	20	171	30	n/a	n/a	4	0	n/a	n/a	33	24	718	17	967	30
DILATED EYE EXAM	164	15	153	14	n/a	n/a	4	0	n/a	n/a	27	19	654	15	802	14

INTRODUCTION

Quality Improvement Organizations (QIOs), also known as Peer Review Organizations (PROs) strive to improve the processes and outcomes of health care. To achieve this goal, QIOs have conducted cooperative projects since 1994 as part of the Health Care Quality Improvement Program established by the Centers for Medicare and Medicaid Services (CMS) formerly the Health Care Financing Administration (HCFA).[1] Cooperative projects consist of collaborative efforts between QIOs and participating health care providers to improve the quality of health care provided to Medicare beneficiaries. Projects rely on criteria called quality indicators, or measurable aspects of care, which are supported by practice guidelines and a consensus of respected health care professionals.

The Managed Care Diabetes Project quality indicators are based upon the national Diabetes Quality Improvement Project (DQIP) and on the Health Plan and Employer Data Information Set (HEDIS) diabetes related measures, which encompass all of the DQIP indicators except for blood pressure and foot exams.[2,3,4] The DQIP indicators represent a common set of comprehensive, evidence-based measures supported by the American Diabetes Association (ADA), the Foundation for Accountability (FACCT), the National Committee on Quality Assurance (NCQA) and CMS. In addition to four process measures that have been linked to patient outcomes, hemoglobin A1c testing (HbA1c), lipid profile, nephropathy assessment, and dilated eye exam, DQIP includes two intermediate outcome measures, control of HbA1c and low density lipoprotein cholesterol (LDL-C).

Initial data abstracted for this project are referred to as "baseline" and follow-up data are referred to as "evaluation". Upon receipt of baseline feedback reports, collaborating managed care organizations were asked to develop improvement plans designed to improve the quality of care delivered to their members with diabetes. Medical Review of North Carolina, Inc. (MRNC) abstracted data from a new set of medical records from each plan following the implementation of the improvement plans. This report depicts baseline and evaluation data for each managed care plan in comparison to all participating Medicaid managed care plans, (hereafter referred to as Medicaid Aggregate).

There are four main sections to the report:

- The **background** section explains the rationale behind the project.
- The **methodology** section describes project quality indicators and the methods used to select the baseline and evaluation samples and perform project data collection.
- The **results** section displays organization-specific data along with comparative data from all participating Medicaid organizations through a series of tables and bar charts.
- The **conclusions** summarize the project results.

Following this report, references utilized in project development are cited. The Appendix contains a list of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes used for case selection, and the data collection instrument.

BACKGROUND

Diabetics are major consumers of health care because they require lifelong treatment. Under-treated diabetes results in many adverse consequences. In the United States, diabetes mellitus is the most important cause of lower extremity amputation and end stage renal disease, the major cause of blindness among working age adults, and a major cause of disability and premature mortality. Diabetes mellitus is an important risk factor for the development of many other acute and chronic conditions such as ketoacidosis, ischemic heart disease and stroke. In a large percentage of the diabetic population, diabetes will lead to major complications such as nephropathy, neuropathy and retinopathy over time, especially if hypertension, blood glucose levels and obesity are not controlled.

Diabetes is the seventh leading cause of death in North Carolina and in the nation.[5,6] North Carolinians with diabetes have an eighty percent greater rate of death from stroke, more than twice the rate of death from coronary heart disease, and three times the rate of death from hypertensive heart disease compared to those without diabetes. In North Carolina, diabetes accounted for 14% of all hospitalizations in 1997 at a cost of about $1.4 billion.[7]

Approximately 300,000 adults in North Carolina have been diagnosed with diabetes, and about 100,000 more may have the disease and not know it.[8] The burden of diabetes in North Carolina is concentrated in older (65 - 74 years of age) residents.[8]

METHODOLOGY

Quality Indicators

Quality indicators are quantitative measures of care that are related to improved patient outcomes. The quality indicators chosen for this project are consistent with six of the eight DQIP and the six HEDIS diabetes related measures. Local adaptation, however, involved reporting of annual rates for all quality indicators, rather than the biennial rates accepted nationally for some of these quality indicators (described further below). All quality indicators use the denominator specified for the HEDIS Comprehensive Diabetes Care Measures.[3,4]

1. Hemoglobin A1c (HbA1c) Testing

This process measure assesses the percentage of diabetes patients who have had at least one HbA1c test during the reporting years of 1998 for baseline and 2000 for evaluation. HbA1c testing is fundamental to assessing the underlying control of the disease since it quantifies glucose control over the previous three months. Many studies have shown that mean HbA1c over a period of time correlates closely with the rate of appearance and progression of microvascular and neuropathic complications.[9] This correlation appeared in type 1 diabetics in the Diabetes Control and Complications Trial (DCCT), and in type 2 diabetics in the United Kingdom Prospective Diabetes Study (UKPDS).[10,11]

Optimal care for many patients may require more frequent testing. In fact, the American Diabetes Association (ADA) recommends quarterly measurement of HbA1c in order to detect departures from metabolic control in a timely manner.[12,13] However, the relationship between

HbA1c test frequency and glycemic control is complex due to variability in patient characteristics, the level of glycemic control desired and the treatment plan. Thus, this quality indicator is necessarily conservative in measuring performance of at least one HbA1c test during the reporting year.

2. HbA1c Control

This intermediate outcome measure assesses the percentage of patients that are in poor glycemic control (HbA1c >9.5%) or have a level of control unknown by the primary care physician, suggesting poor management of diabetic patients. Control is determined based upon the most recent HbA1c test result within the study periods.

As noted above, there is substantial evidence showing a direct relationship between HbA1c levels and the risk of microvascular complications. For every one percentage point reduction in the HbA1c test value in UKPDS, there was a 35% reduction in damage to the eyes, kidneys and nerves, and a 25% reduction in diabetes-related deaths.[11]

Although standardization of all measurement of glycated hemoglobin to the HbA1c assay used in the DCCT is underway, various HbA1c assays were employed during the project study periods. According to DQIP very few individuals should have an HbA1c value greater than 9.5% regardless of the test used or the condition of the patient.

3. Lipid Profile

This process measure assesses the percentage of diabetic patients who had a lipid profile performed within the study periods. Hyperlipidemia is a major risk factor for macrovascular disease in diabetics, the greatest cause of diabetic mortality and expense.[9] Type 2 diabetes, for instance, is associated with a two- to four-fold excess risk of coronary heart disease.[12]

The ADA recommends adult diabetics undergo annual testing for lipid disorders with fasting serum cholesterol, triglyceride, high density lipoprotein cholesterol (HDL-C) and LDL-C measurements. The ADA also recommends reevaluation of lipid values following a macrovascular event.[12,13]

4. LDL-C Control

This intermediate outcome measure assesses the percentage of diabetic patients with LDL-C within accepted risk levels (<130 mg/dL). Control was determined based upon the most recent LDL-C value obtained in 1998 (baseline) and 2000 (evaluation).

Studies demonstrate a direct relationship between LDL-C level and risk of myocardial events or mortality. LDL-C lowering has been shown to greatly reduce morbidity and mortality. According to the ADA position statement, "Management of Dyslipidemia in Adults with Diabetes," interventions to lower triglyceride levels and raise HDL cholesterol may be useful, but primary emphasis should be placed on lowering LDL-C levels.[12,13]

5. Nephropathy Assessment

This process measure assesses the percentage of diabetes patients who have been screened for diabetic nephropathy at least once during 1998 (baseline) and 2000 (evaluation) via urinalysis or microalbuminuria testing (latter only if indicated). This measure addresses whether health plans and providers are identifying high risk patients in terms of potential renal complications.

There is clear evidence that the presence of small amounts of protein in the urine (micro-albuminuria), which are not detectable by the usual dipstick method, identifies a subset of diabetic patients who are at significantly increased risk of coronary artery disease, sudden death, diabetic nephropathy and End Stage Renal Disease (ESRD). This subset of diabetics could benefit from treatment with angiotensin converting enzyme (ACE) inhibitors, which have proved to be effective in preventing nephropathy in patients with microalbuminuria.[9]

The ADA recommends an annual urinalysis for adults with diabetes, followed by microalbu-minuria testing if the urinalysis is negative for protein. Three screening methods are endorsed: measurement of the albumin to creatinine ratio in a random collection, 24-hour collection with creatinine and timed collection (e.g., 4-hour or overnight). A positive test for macroalbuminuria is acceptable as evidence of a nephropathy assessment, however a negative test for macroalbuminuria requires testing for microalbuminuria.[12] Cases in the samples with a documented history of nephropathy per medical record review were excluded from the eligible cases for this measure (the denominator).

6. Dilated Eye Exam

This process measure assesses the percentage of diabetic patients receiving a dilated eye exam during the study periods. It is acceptable for patients with diabetes to receive an eye exam within the past **two** years if any <u>two</u> of the following conditions are met: (1) patient is <u>not</u> taking insulin; (2) patient has an HbA1c <8.0% (according to most recent test result within study period); (3) patient did <u>not</u> have evidence of retinopathy on previous year's eye exam. This risk stratification scheme is utilized because screening strategies for diabetics depend on the rates of appearance and progression of retinopathy and on risk factors that alter these rates.[12] Because participating health care organizations preferred measuring performance of dilated eye exams within the past year only, cases meeting the criteria for biennial eye exams were excluded from calculation of the annual eye exam rate.

The exam in this measure must be performed by either an ophthalmologist or an optometrist. An acceptable alternative to the dilated eye exam is seven-field stereoscopic 30-degree fundus photography read by an optometrist or ophthalmologist.

Diabetes is the leading cause of blindness in the United States, and studies show that a periodic dilated eye exam is cost-effective in reducing the burden of diabetic retinopathy and blindness. The cost of screening for diabetic retinopathy is often less than the disability payments provided to people who would go blind in the absence of a screening program.[12]

Sample Selection

Each participating health plan identified their diabetic members following the HEDIS Comprehensive Diabetes Care denominator specifications, resulting in a study population of diabetics enrolled in Medicaid managed care.[3,4] Cases were eligible for project inclusion if they met the following criteria:

- Two face-to-face encounters with different dates of service in an ambulatory setting or non-acute inpatient setting or one face-to-face encounter in an acute inpatient or emergency room setting during 1998 (baseline) or 2000 (evaluation) with a diagnosis of diabetes (see Appendix for complete listing of acceptable ICD-9-CM diagnostic codes) per claims/encounter data.
- Enrolled as of December 31, 1998 with no more than one gap in enrollment of up to forty-five days during 1998 for baseline sample. And enrolled as of December 31, 2000 with no more than one gap in enrollment of up to forty-five days during 2000 for evaluation sample.
- Between the ages of eighteen and seventy-five as of December 31, 1998, baseline and December 31, 2000, evaluation.

After identifying the eligible patient populations, each managed care organization identified a primary care physician for each patient.

At baseline all patients identified by the managed care organizations were considered eligible for abstraction. At evaluation, power calculations resulted in a goal sample size of 400 cases per managed care plan with a 10% case per plan over sample.

Project Data Collection

Patient demographic information for project cases was imported from managed care organization databases into an electronic data collection tool, which was developed to capture information on patient characteristics and care processes from primary care medical records. Specially trained nurses and health information management personnel employed by MRNC entered data into the tool during on-site medical record abstraction. Standard data reliability testing was performed, including intra- and inter-rater testing, to ensure accuracy and consistency in data collection.

RESULTS

Analyses were conducted at both the managed care plan level and for all participating Medicaid managed care organizations (Medicaid Aggregate) using SAS®, a statistical software program.[14] All quality indicators are defined as proportions. Unless otherwise noted, the denominator used to calculate percentages is based on "N" (sample size) for the organization and for the aggregate. In some cases, missing values or exclusion criteria may change the denominator, making it smaller than "N." When this occurs, the new "N" will be indicated. Also, values were rounded off to the nearest whole number, causing some totals to be slightly less than or greater than 100%.

Patient Descriptors

Table 1 provides organization and aggregate level demographic and medical history information.

Table 1 : Patient Descriptors

Category	Access 1		Access 2/3		Williams		Wellness		Southcare		United		Aggregate	
B=baseline, E=evaluation	**B**	**E**	**B**	**E**	**B**	**E**	**B**	**E**	**B**	**E**	**B**	**E**	**B**	**E**
	N=327	N=441	N=256	N=441	N=8	N=17	N=192	N=202	n/a	N=4	n/a	N=35	N=783	N=1140
Race														
African-American	51%	45%	62%	58%	75%	76%	67%	70%	n/a	50%	n/a	46%	58%	55%
Caucasian	37%	43%	32%	37%	25%	12%	20%	16%	n/a	25%	n/a	26%	31%	35%
Other	4%	6%	2%	1%	0%	6%	3%	7%	n/a	0%	n/a	9%	3%	4%
Unknown	8%	6%	5%	4%	0%	6%	10%	6%	n/a	25%	n/a	20%	7%	6%
Gender														
Male	21%	23%	18%	20%	25%	24%	17%	21%	n/a	50%	n/a	23%	19%	22%
Female	79%	77%	82%	80%	75%	76%	83%	79%	n/a	50%	n/a	77%	81%	78%
Age														
18 - 44	35%	22%	33%	23%	38%	18%	51%	33%	n/a	75%	n/a	43%	38%	25%
45 - 64	62%	63%	63%	60%	63%	82%	49%	67%	n/a	25%	n/a	57%	59%	62%
65 - 75	3%	15%	4%	17%	0%	0%	0%	0.5%	n/a	0%	n/a	0%	3%	13%
Mean ± Std.	49±12	53±11	49±11	53±12	47±10	51±8	44±12	49 ±12	n/a	48±9	n/a	47±12	48±12	52±12
Medical History														
Insulin Use	48%	42%	51%	46%	38%	41%	53%	49%	n/a	50%	n/a	49%	50%	45%
Current Smoker	24%	27%	27%	30%	0%	47%	32%	32%	n/a	50%	n/a	23%	27%	29%
History of CAD*	25%	25%	18%	27%	0%	24%	9%	17%	n/a	25%	n/a	14%	19%	24%
History Non-traumatic LEA**	3%	3%	4%	5%	0%	0%	4%	2%	n/a	0%	n/a	0%	4%	3%

* CAD denotes Coronary Artery Disease
** LEA denotes Lower Extremity Amputation

Quality Indicators

The following figures depict performance on the six project quality indicators.

Figure 1

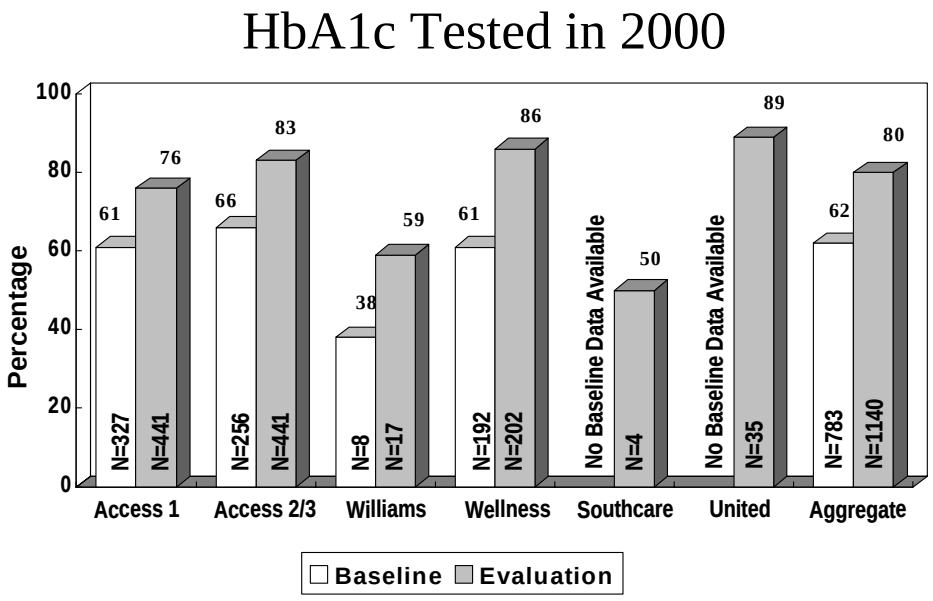
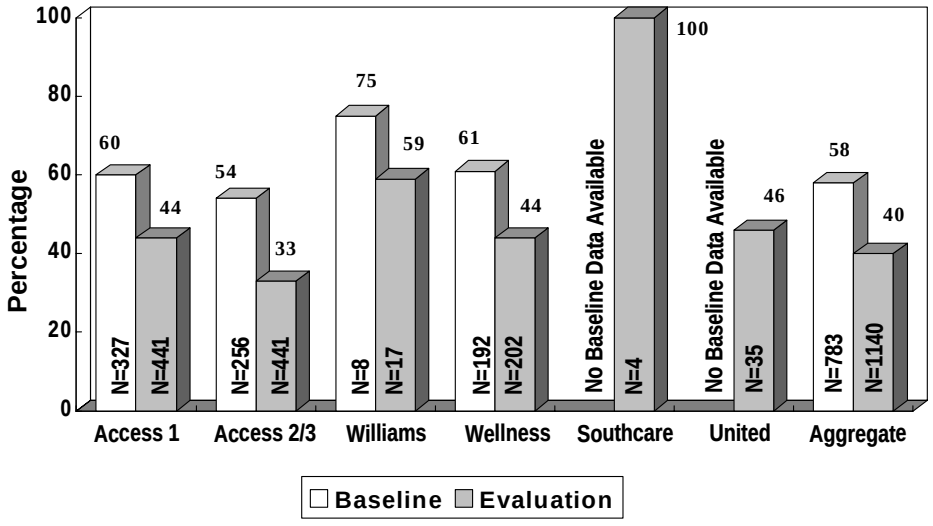


Figure 2



*Poor control if HbA1c >9.5% or unknown. Excludes cases where lab normal reference range is unknown

Figure 3

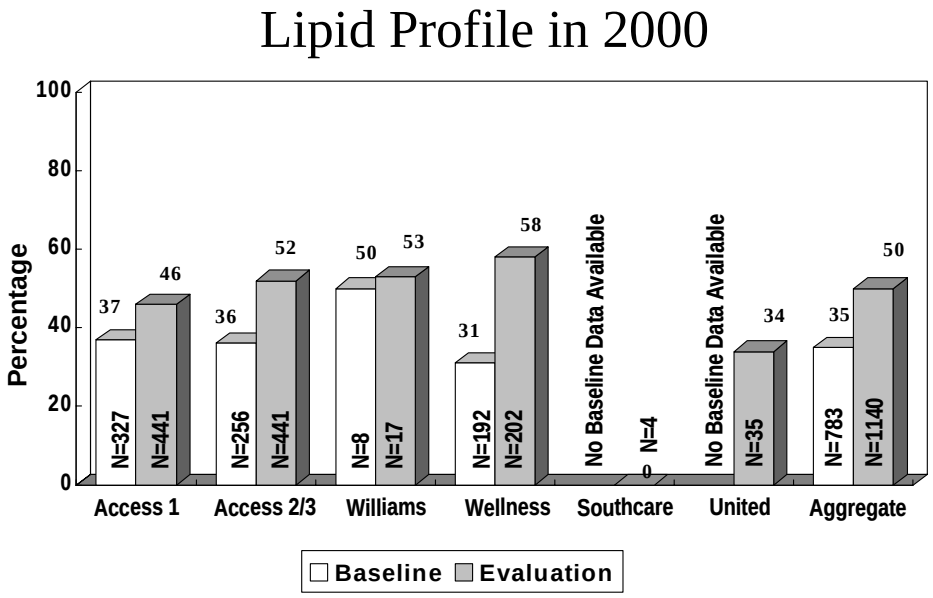
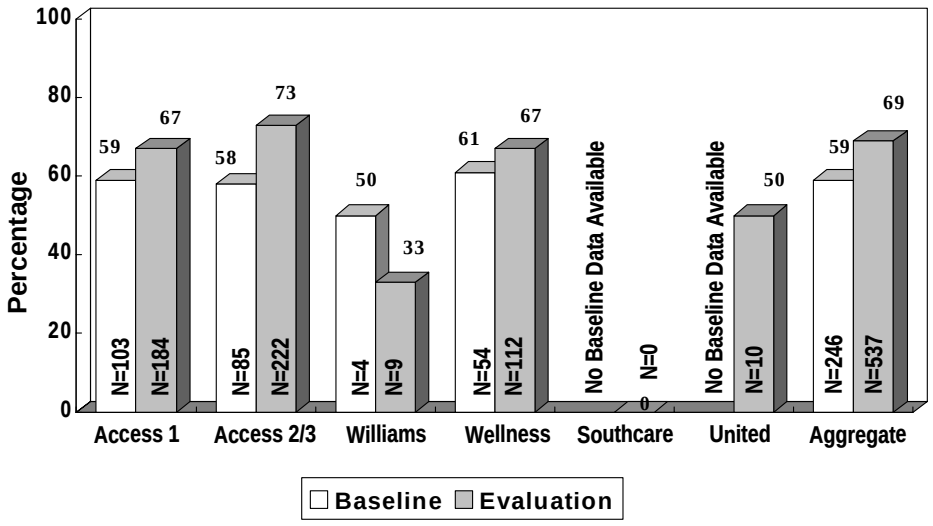


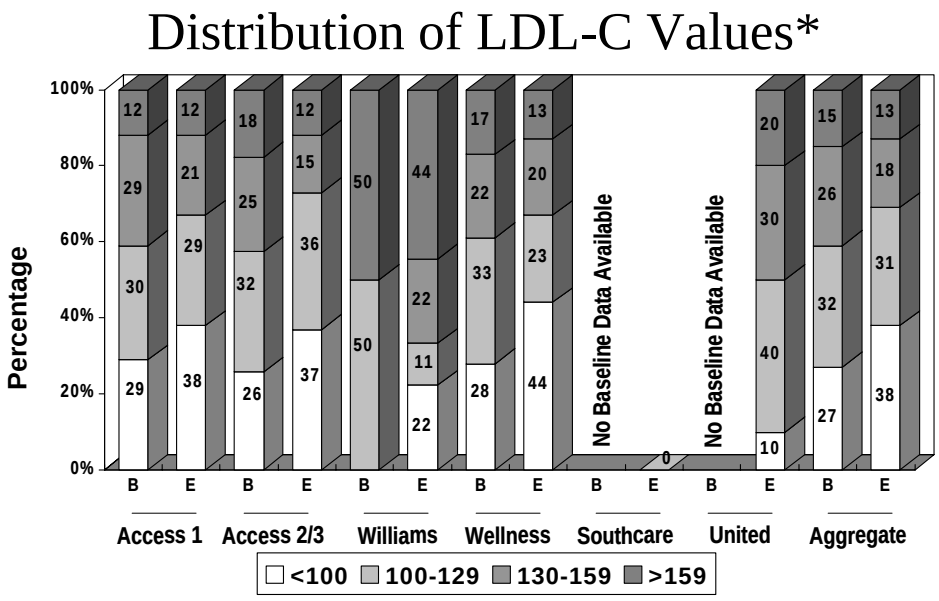
Figure 4



*For patients with lipid profiles, excludes cases with no LDL measurement

The ADA Clinical Practice Recommendations 2001 indicate the optimal LDL-C levels for adults with diabetes as <100mg/dl (2.60 mmol/l). The recommendations for treatment of elevated LDL-C indicate that pharmacological therapy should be initiated for patients with diabetes and clinical cardiovascular disease at LDL-C levels >100 and for those patients without cardiovascular disease at LDL-C levels of ≥130.[13] The Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III, or ATP III published after the ADA 2001 recommendations recognizes diabetes alone as a coronary heart disease equivalent since diabetes confers a high risk of new coronary heart disease within 10 years.[15] The DQIP and HEDIS indicators do not, as of yet, recognize the more recently published information from the ADA and ATP III. Figure 5 below displays the distribution of LDL-C levels.

Figure 5

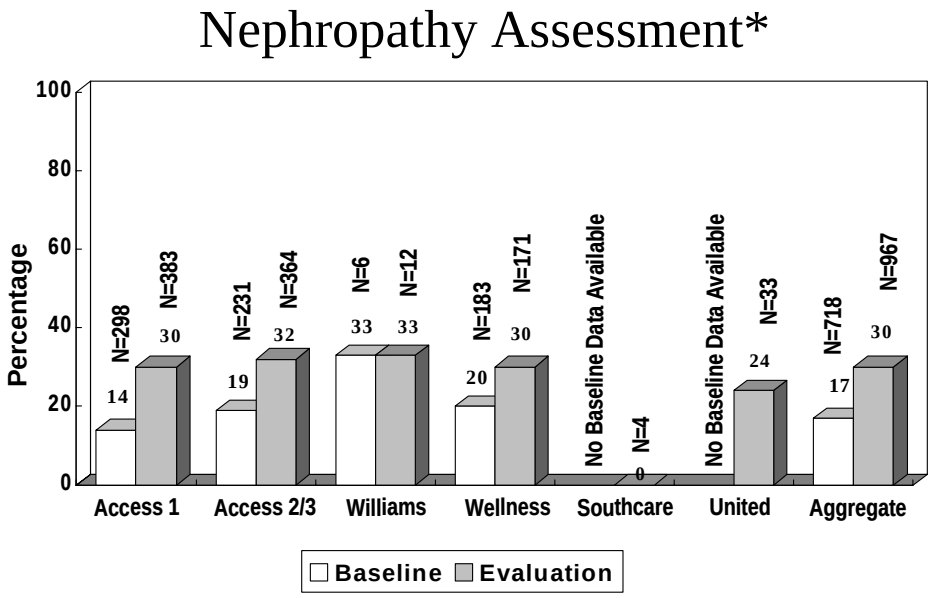


* LDL-C value abstracted from most recent test in the reporting year

MEAN + STANDARD DEVIATION

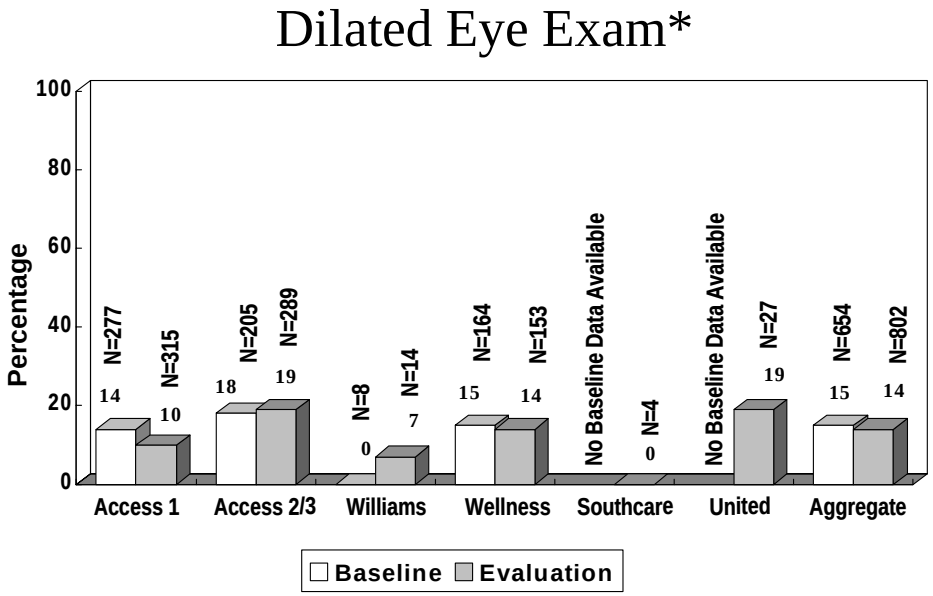
	Baseline	Evaluation
Access 1	122 ± 42	114 ± 41
Access 2/3	127 ± 38	114 ± 37
Williams	185 ± 93	148 ± 54
Wellness	123 ± 38	114 ± 39
Southcare	n/a	0
United	n/a	147 ± 52
Aggregate	125 ± 41	115 ± 40

Figure 6



* Microalbuminuria test or positive macroalbuminuria in patients with no history of nephropathy

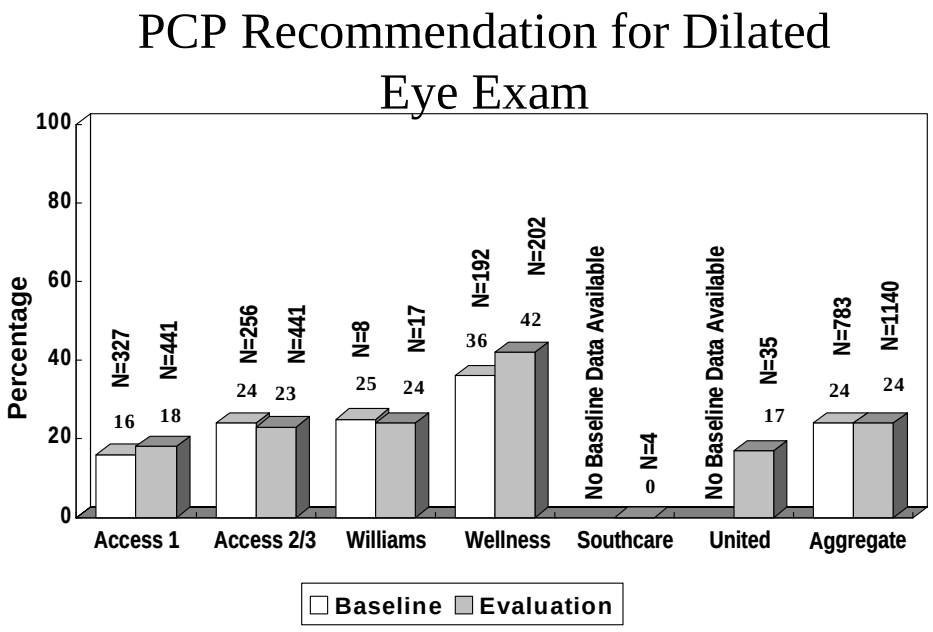
Figure 7



* Excludes patients with two of the following: not currently on insulin, no evidence ofr etinopathy in 1999, HbA1c <8%

Inefficient or nonexistent feedback from eye professionals to the primary care physicians may result in an underestimate of the documented number of eye exams performed. Therefore, Figure 8 indicates the rate of documented PCP recommended eye exams.

Figure 8


PCP Recommendation for Dilated Eye Exam
Percentage
100
80
60
40
20
0
N=327
N=441
16
18
N=256
N=441
24
23
N=8
N=17
25
24
N=192
N=202
36
42
No Baseline Data Available
N=4
0
No Baseline Data Available
N=35
17
N=783
N=1140
24
24
Access 1
Access 2/3
Williams
Wellness
Southcare
United
Aggregate
Baseline
Evaluation

CONCLUSIONS

Results from the Medicaid Aggregate data indicate statistically significant improvement ($p<.05$) from the baseline in all of the quality indictors except dilated eye exams. The high morbidity and mortality associated with diabetic complications may be prevented by continued emphasis on improving performance on the Managed Care Diabetes Project quality indicators.

While the primary care physician can be held accountable for ordering HbA1c tests, lipid profiles, and urinalyses or microalbuminuria tests, the dilated eye exam does present somewhat of a challenge. Although, there are real barriers to including dilated eye exams into primary care encounters, primary care physicians can have a significant impact on diabetic eye care by discussing eye care with their diabetic patients. According to a December 1999 press release from the National Institutes of Health, patient education leads to more eye exams in groups at risk for diabetic eye disease.[16]

The low performance rate on the dilated eye exam indicator may be explained in part by the possibility that results from exams performed by eye professionals may not be communicated back to the primary care office. However, this does not explain the low rate of primary care physician documentation of recommendation for the exam.

All correspondence regarding this publication should be addressed to:
Jill McArdle, RN, MSPH
Manager, Health Care Quality Assessment
Medical Review of North Carolina, Inc.
P.O. Box 37309
Raleigh, NC 27627
(919) 851-2955 or (800) 682-2650

Project Team

David Brown, MSPH
Analyst II

Joan Howard, RHIT
Associate, Project Support

Mark Massing, MD, MPH
Clinical Epidemiologist

Mridul Chowdhury, Ph.D.
Senior Associate, Biostatistics

Jill McArdle, RN, MSPH
Manager, Healthcare Quality Assessment

Sharon Peacock
Analytic Associate II

Jennifer Davis
Analytic Associate I

Joanne Kelly, RN
Associate, Physician Data Management

Ross Simpson, Jr., MD, Ph.D.
Principal Clinical Coordinator

REFERENCES

1. Jencks SF, Wilensky GR. The health care quality improvement initiative. JAMA 1992; 268: 900-903.
2. Diabetes Quality Improvement Project (DQIP) http://www.hcfa.gov/quality/3l.htm.
3. National Committee for Quality Assurance (NCQA). HEDIS 1999 technical specifications. Washington (DC): NCQA;1998.
4. National Committee for Quality Assurance (NCQA). HEDIS 2001 technical specifications. Washington (DC): NCQA; 2000.
5. Bell RA, Huston S, Passaro K, Lengerich E. The impact of diabetes mellitus on cardiovascular disease in North Carolina. NCMJ 1998; 59(4): 222-226.
6. National Institute of Diabetes and Digestive and Kidney Disease. Diabetes statistics. National Diabetes Information Clearinghouse (http://www.niddk.nih.gov/health/diabetes/pubs/dmstats/dmstats.htm) 1998.
7. Diabetes Control Program, Division of Community Health, Department of Health and Human Services, Raleigh, NC. The burden of diabetes in North Carolina. Department of Health and Human Services, Raleigh, NC. October 1998.
8. Diabetes Control Program and Office of Epidemiology, Division of Community Health, Department of Health and Human Services, Raleigh, NC. Diabetes in North Carolina: prevalence, complications, costs. State Center for Health Statistics, Department of Health and Human Services, Raleigh, NC. October 1997.
9. Greenfield S, Kaplan S, Purdy S. Measuring health care quality: diabetes. AHCPR Pub. No.96-N022; August 1996.
10. Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. NEJM 1993; 329:977-986.
11. American Diabetes Association. The United Kingdom Prospective Diabetes Study. http://www.diabetes.org/ada/ukpds.htm 1998: 1-4.
12. American Diabetes Association. Clinical practice recommendations 1998. Diabetes Care 1998;21: (http://www.diabetes.org/DiabetesCare/Supplement198).
13. American Diabetes Association. Clinical practice recommendations 2001. Diabetes Care. Suppl 1:S1-133, 2001 January.
14. SAS Institute, Inc., SAS User's guide, version 6, 4th ed., vol.1. Cary, NC: SAS Institute, Inc., 1989.
15. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III). JAMA 2001;285:2486-2497.
16. National Institutes of Health. Health education leads to more eye exams in groups at risk for vision loss. (Press release, Monday, December 6, 1999).

APPENDIX
ICD-9-CM Codes

250.00 Type 2 diabetes mellitus (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) without mention of complication*

250.01 Type 1 diabetes mellitus (insulin dependent, juvenile type, not stated as uncontrolled) without mention of complication

250.02 Type 2 diabetes mellitus (non-insulin dependent, adult-onset or unspecified type, uncontrolled) without mention of complicatio.*

250.03 Type 1 diabetes mellitus (insulin dependent, juvenile type, uncontrolled) without mention of complication

250.10 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with ketoacidosis*

250.11 Type 1 diabetes (insulin dependent, juvenile type, not stated as uncontrolled) with ketoacidosis

250.12 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with ketoacidosis*

250.13 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with ketoacidosis

250.20 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with hyperosmolarity*

250.21 Type 1 diabetes (insulin dependent, juvenile type, not stated as uncontrolled) with hyperosmolarity

250.22 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with hyperosmolarity*

250.23 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with hyperosmolarity

250.30 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with other coma*

250.31 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with other coma

250.32 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with other coma*

250.33 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with other coma

250.40 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with renal manifestations*

250.41 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with renal manifestations

250.42 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with renal manifestations*

250.43 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with renal manifestations

250.50 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with ophthalmic manifestations*

250.51 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with ophthalmic manifestations

250.52 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with ophthalmic manifestations

250.53 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with ophthalmic manifestations

250.60 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with neurological manifestations*

250.61 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with neurological manifestations

250.62 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with neurological manifestations*

250.63 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with neurological manifestations

250.70 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with peripheral circulatory disorders*

250.71 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with peripheral circulatory disorders

250.72 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with peripheral circulatory disorders*

250.73 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with peripheral circulatory disorders

250.80 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with other specified manifestations*

250.81 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with other specified manifestations

250.82 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with other specified manifestations*

250.83 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with other specified manifestations

250.90 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with unspecified complication*

250.91 Type 1 diabetes (non-insulin dependent, adult-onset or unspecified type, not stated as uncontrolled) with unspecified complication

250.92 Type 2 diabetes (non-insulin dependent, adult-onset or unspecified type, uncontrolled) with unspecified complication*

250.93 Type 1 diabetes (insulin dependent, juvenile type, uncontrolled) with unspecified complication

357.2 Polyneuropathy in diabetes

357.3 Background diabetic retinopathy

362.01 Proliferative diabetic retinopathy

366.41 Diabetic cataract

648.0 Pregnancy with pre-existing diabetes

* The following 5th digit subclassification is for use with category 250: a 5th digit 0 or 2 is used for Type 2 diabetic patients even if the patient requires insulin.

Abstraction Tool